

# STW46NF30 Datasheet



www.digi-electronics.com

<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	STW46NF30-DG
Manufacturer	<a href="#">STMicroelectronics</a>
Manufacturer Product Number	STW46NF30
Description	MOSFET N-CH 300V 42A TO247
Detailed Description	N-Channel 300 V 42A (Tc) 300W (Tc) Through Hole TO-247-3

This model STW46NF30 is available at DiGi Electronics.

DiGi Electronics offers a global database of semiconductor and electronic component datasheets.

We welcome your inquiries regarding pricing, lead time, or other product-related questions.

 [Request a Quote](#)

 [Datasheet Search](#)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

**Manufacturer Product Number:**

STW46NF30

**Series:**

STripFET™ II

**FET Type:**

N-Channel

**Drain to Source Voltage (Vdss):**

300 V

**Drive Voltage (Max Rds On, Min Rds On):**

10V

**Vgs(th) (Max) @ Id:**

4V @ 250µA

**Vgs (Max):**

±20V

**FET Feature:**

-

**Operating Temperature:**

175°C (TJ)

**Supplier Device Package:**

TO-247-3

**Base Product Number:**

STW46

**Manufacturer:**

STMicroelectronics

**Product Status:**

Active

**Technology:**

MOSFET (Metal Oxide)

**Current - Continuous Drain (Id) @ 25°C:**

42A (Tc)

**Rds On (Max) @ Id, Vgs:**

75mOhm @ 17A, 10V

**Gate Charge (Qg) (Max) @ Vgs:**

90 nC @ 10 V

**Input Capacitance (Ciss) (Max) @ Vds:**

3200 pF @ 25 V

**Power Dissipation (Max):**

300W (Tc)

**Mounting Type:**

Through Hole

**Package / Case:**

TO-247-3

## Environmental & Export classification

**RoHS Status:**

ROHS3 Compliant

**REACH Status:**

REACH Unaffected

**HTSUS:**

8541.29.0095

**Moisture Sensitivity Level (MSL):**

1 (Unlimited)

**ECCN:**

EAR99



# STB46NF30, STP46NF30, STW46NF30

N-channel 300 V, 0.063  $\Omega$  typ., 42 A STripFET™ II  
Power MOSFETs in D<sup>2</sup>PAK, TO-220 and TO-247 packages

Datasheet - production data

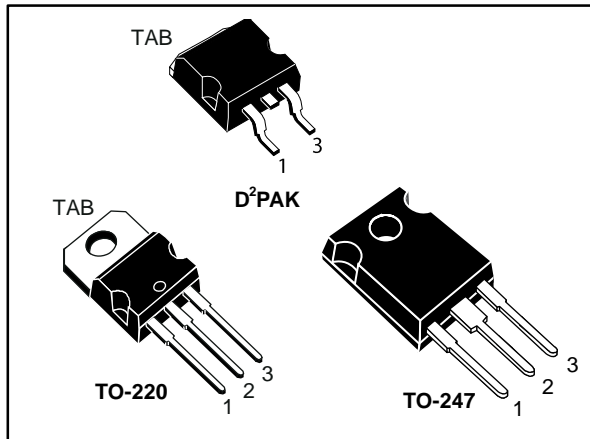
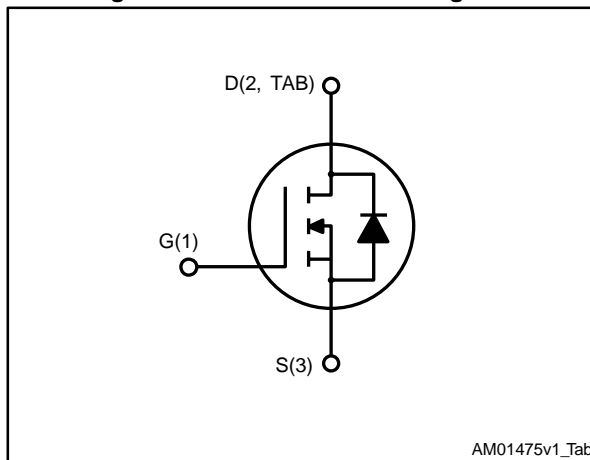


Figure 1: Internal schematic diagram



## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>w</sub>
STB46NF30	300 V	< 0.075 $\Omega$	42 A	300 W
STP46NF30				
STW46NF30				

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

## Applications

- Switching applications

## Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1: Device summary

Order code	Marking	Package	Packing
STB46NF30	46NF30	D <sup>2</sup> PAK	Tape and reel
STP46NF30		TO-220	Tube
STW46NF30		TO-247	

---

**Contents**

<b>1</b>	<b>Electrical ratings .....</b>	<b>3</b>
<b>2</b>	<b>Electrical characteristics .....</b>	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits .....</b>	<b>9</b>
<b>4</b>	<b>Package information .....</b>	<b>10</b>
	4.1 D <sup>2</sup> PAK (TO-263) package information .....	10
	4.2 D <sup>2</sup> PAK (TO-263) packing information.....	13
	4.3 TO-220 type A package information.....	15
	4.4 TO-247 package information.....	17
<b>5</b>	<b>Revision history .....</b>	<b>19</b>

# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	300	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	42	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	27	A
$I_{DM}^{(1)}$	Drain current (pulsed)	168	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
$T_J$	Operating junction temperature range	- 55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		

**Notes:**

(1)Pulse width limited by safe operating area.

(2) $I_{SD} \leq 34\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$ ,  $V_{DS\text{ peak}} < V_{(BR)DSS}$

**Table 3: Thermal data**

Symbol	Parameter	Value			Unit
		D <sup>2</sup> PAK	TO-220	TO-247	
$R_{thj-case}$	Thermal resistance junction-case	0.5			$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	30	62.5	50	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	30			$^\circ\text{C}/\text{W}$
$T_J$	Maximum lead temperature for soldering purpose	300			$^\circ\text{C}$

**Notes:**

(1)When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu.

**Table 4: Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AR}^{(1)}$	Avalanche current, repetitive or not repetitive (pulse width limited by $T_{jmax}$ )	26	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	290	mJ

**Notes:**

(1)Pulse width limited by  $T_{jmax}$

## 2 Electrical characteristics

$T_C = 25\text{ °C}$  unless otherwise specified

**Table 5: On/off-state**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$	300			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 300\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 300\text{ V}$ $T_C = 125\text{ °C}$ <sup>(1)</sup>			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 17\text{ A}$		0.063	0.075	$\Omega$

**Notes:**

<sup>(1)</sup>Defined by design, not subject to production test.

**Table 6: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	3200	-	pF
$C_{oss}$	Output capacitance		-	442	-	pF
$C_{rss}$	Reverse transfer capacitance		-	57	-	pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 150\text{ V}$ , $I_D = 17\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$ (see <a href="#">Figure 16: "Test circuit for resistive load switching times"</a> )	-	25	-	ns
$t_r$	Rise time		-	38	-	ns
$t_{d(off)}$	Turn-off delay time		-	80	-	ns
$t_f$	Fall time		-	46	-	ns
$Q_g$	Total gate charge	$V_{DD} = 240\text{ V}$ , $I_D = 34\text{ A}$ $V_{GS} = 10\text{ V}$ (see <a href="#">Figure 17: "Test circuit for gate charge behavior"</a> )	-	90	-	nC
$Q_{gs}$	Gate-source charge		-	16	-	nC
$Q_{gd}$	Gate-drain charge		-	40	-	nC

## STB46NF30, STP46NF30, STW46NF30

## Electrical characteristics

Table 7: Source-drain diode

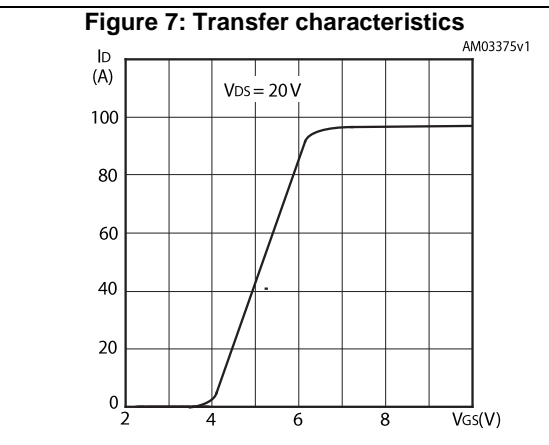
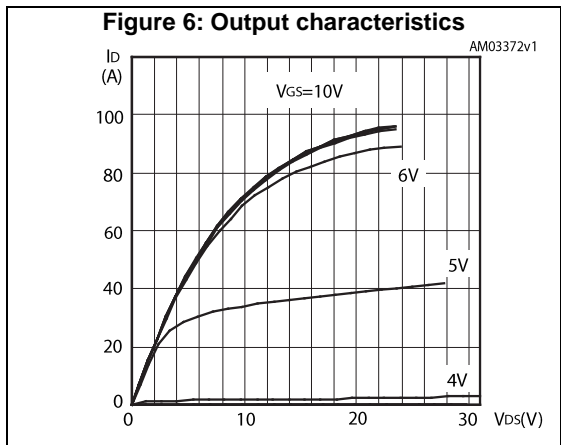
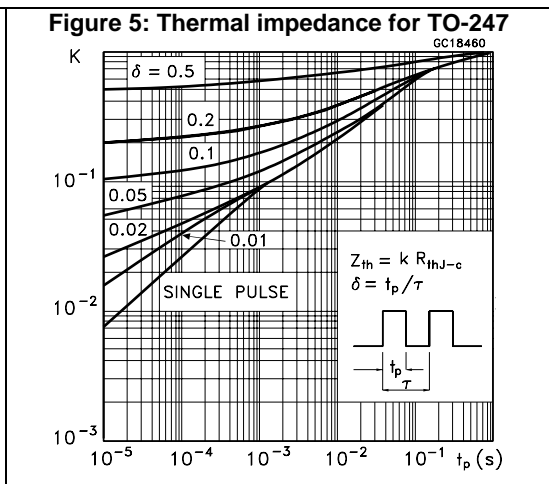
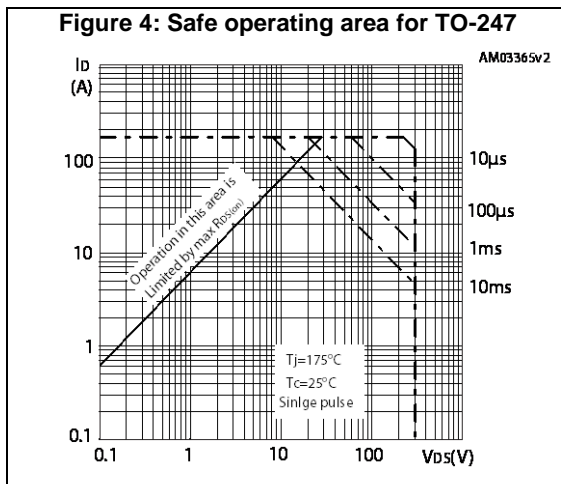
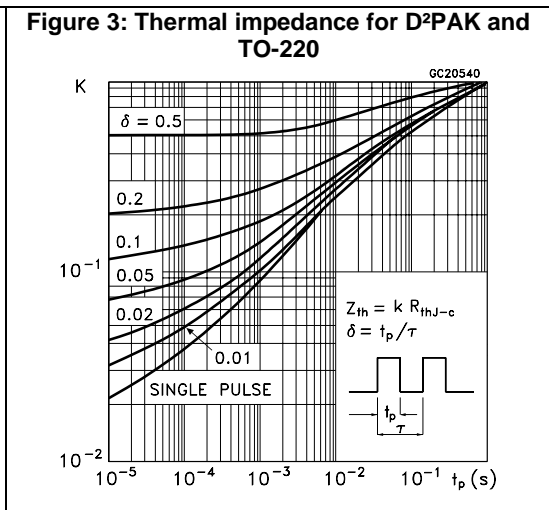
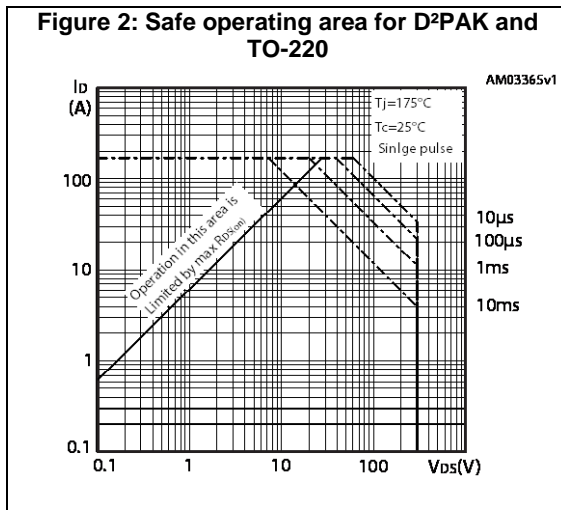
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		34	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		136	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 34 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 34 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 60 \text{ V}$ (see <a href="#">Figure 18: "Test circuit for inductive load switching and diode recovery times"</a> )	-	215		ns
$Q_{rr}$	Reverse recovery charge		-	1.7		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	16		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 34 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 60 \text{ V}$ , $T_j = 150 \text{ }^\circ\text{C}$ (see <a href="#">Figure 18: "Test circuit for inductive load switching and diode recovery times"</a> )	-	252		ns
$Q_{rr}$	Reverse recovery charge		-	2.3		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	19		A

**Notes:**

(1)Pulse width limited by safe operating area

(2)Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

2.2 Electrical characteristics (curves)



STB46NF30, STP46NF30, STW46NF30

Electrical characteristics

Figure 8: Gate charge vs gate-source voltage

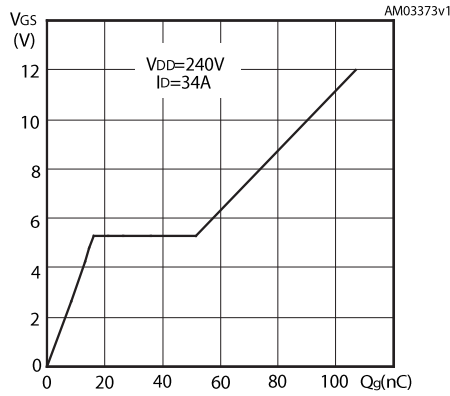


Figure 9: Static drain-source on-resistance

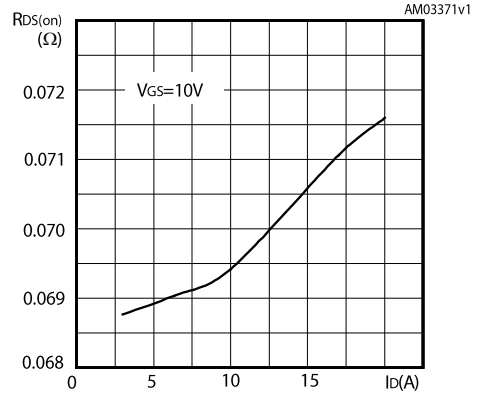


Figure 10: Capacitance variations

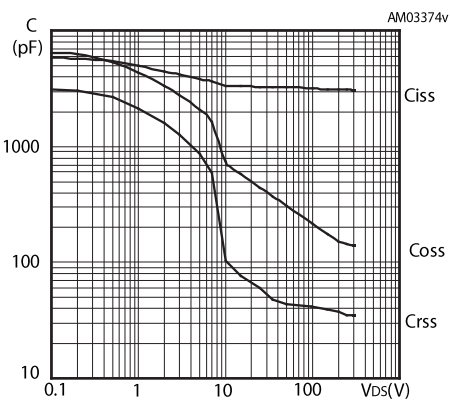


Figure 11: Normalized gate threshold voltage vs temperature

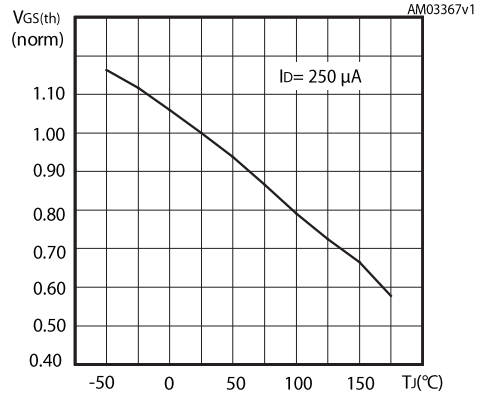


Figure 12: Normalized on-resistance vs temperature

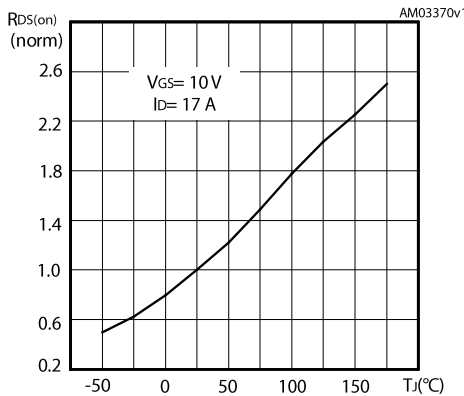
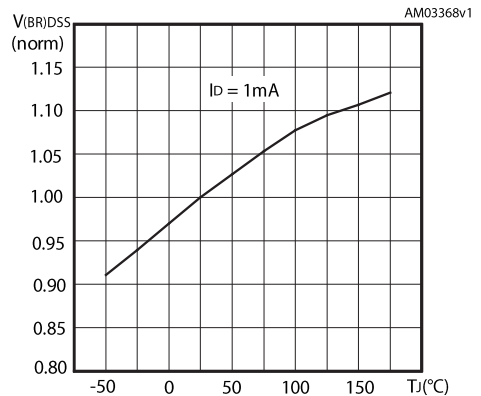


Figure 13: Normalized V(BR)DSS vs temperature



Electrical characteristics

STB46NF30, STP46NF30, STW46NF30

Figure 14: Avalanche energy vs starting  $T_j$

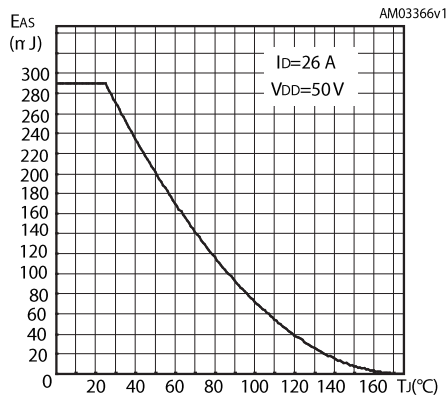
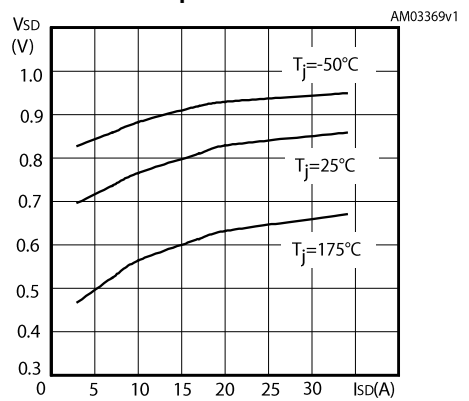
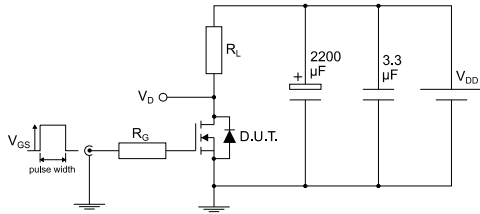


Figure 15: Source-drain diode forward vs temperature



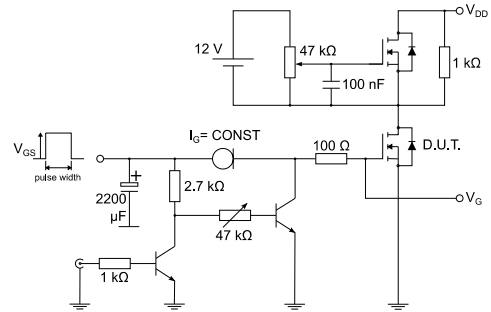
### 3 Test circuits

**Figure 16: Test circuit for resistive load switching times**



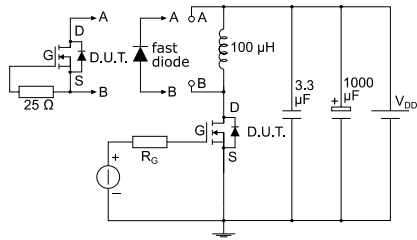
AM01468v1

**Figure 17: Test circuit for gate charge behavior**



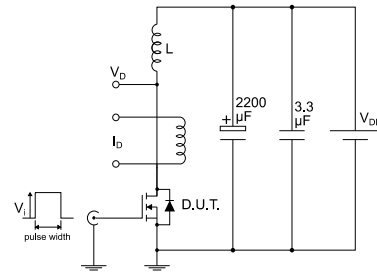
AM01469v1

**Figure 18: Test circuit for inductive load switching and diode recovery times**



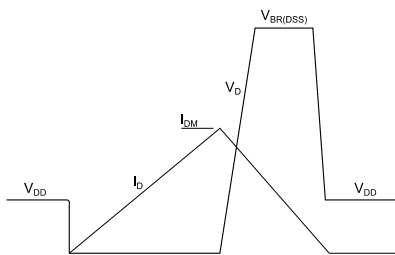
AM01470v1

**Figure 19: Unclamped inductive load test circuit**



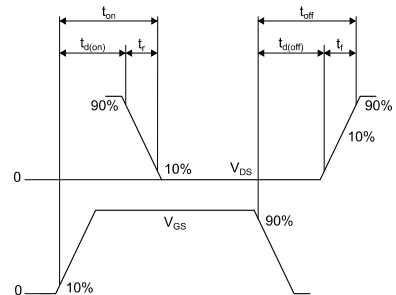
AM01471v1

**Figure 20: Unclamped inductive waveform**



AM01472v1

**Figure 21: Switching time waveform**



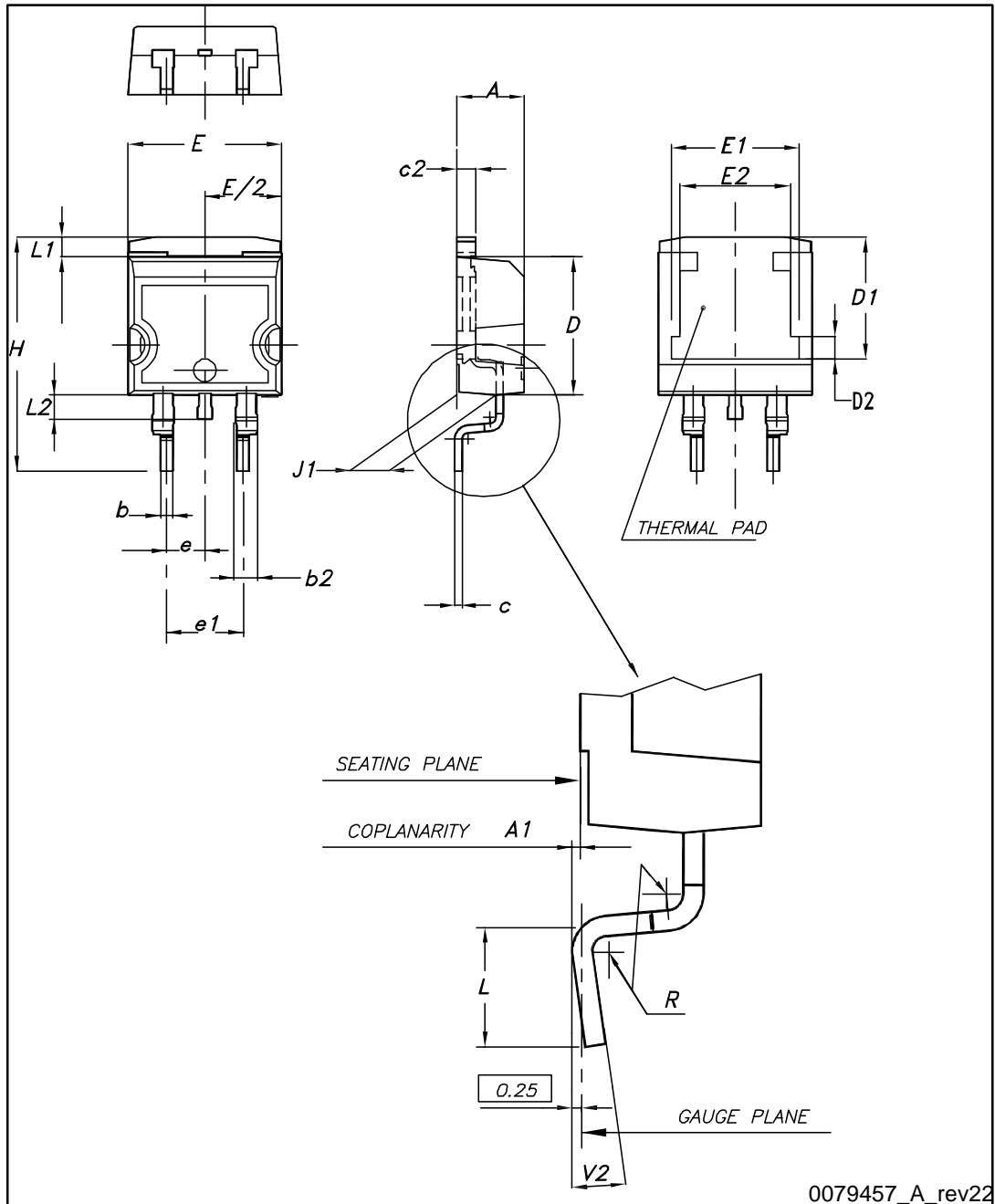
AM01473v1

## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

### 4.1 D<sup>2</sup>PAK (TO-263) package information

Figure 22: D<sup>2</sup>PAK (TO-263) type A package outline



## STB46NF30, STP46NF30, STW46NF30

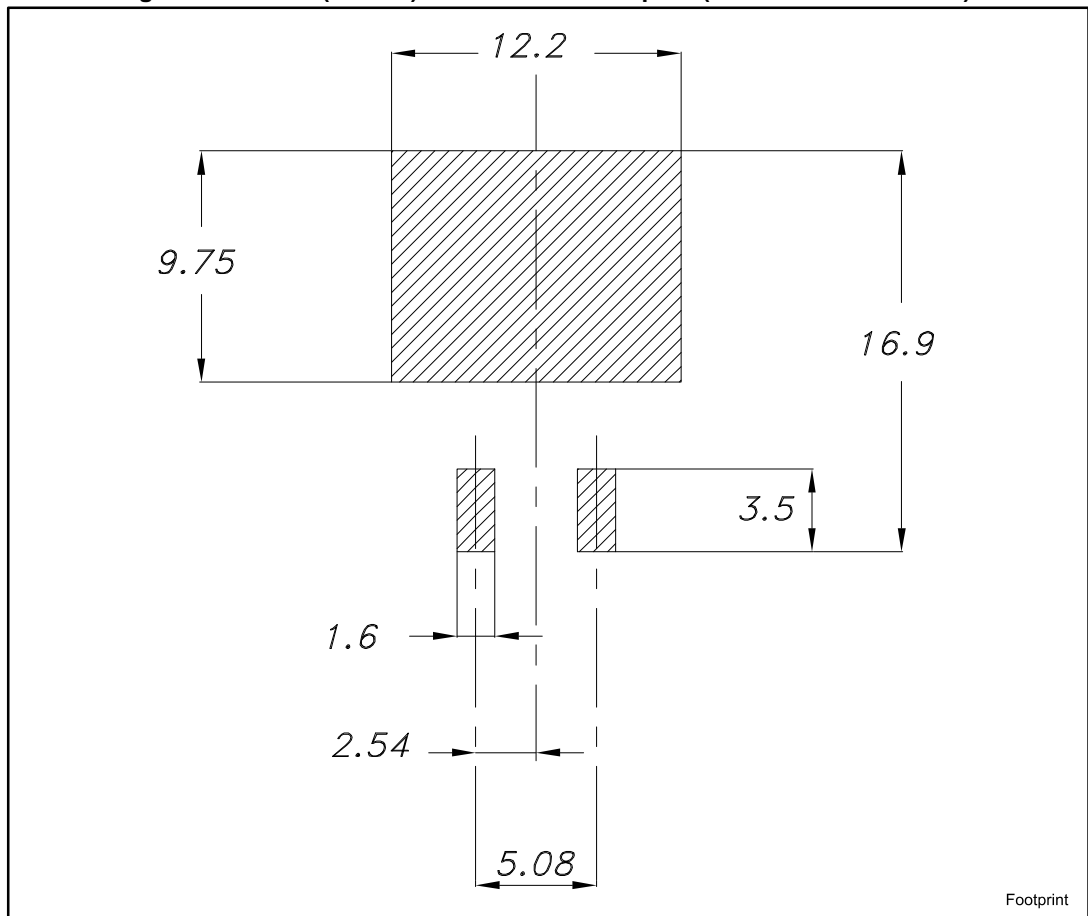
## Package information

Table 8: D<sup>2</sup>PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

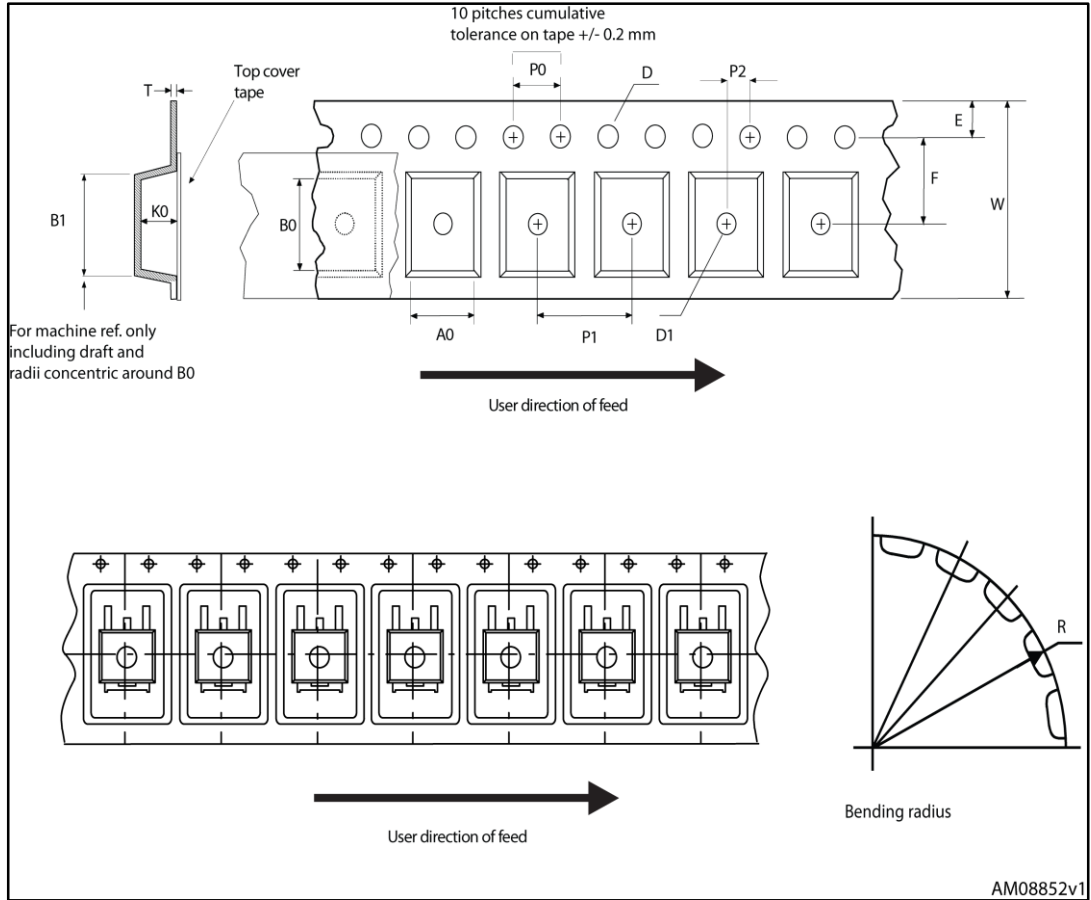
## Package information

## STB46NF30, STP46NF30, STW46NF30

Figure 23: D<sup>2</sup>PAK (TO-263) recommended footprint (dimensions are in mm)

4.2 D<sup>2</sup>PAK (TO-263) packing information

Figure 24: Tape outline



Package information

STB46NF30, STP46NF30, STW46NF30

Figure 25: Reel outline

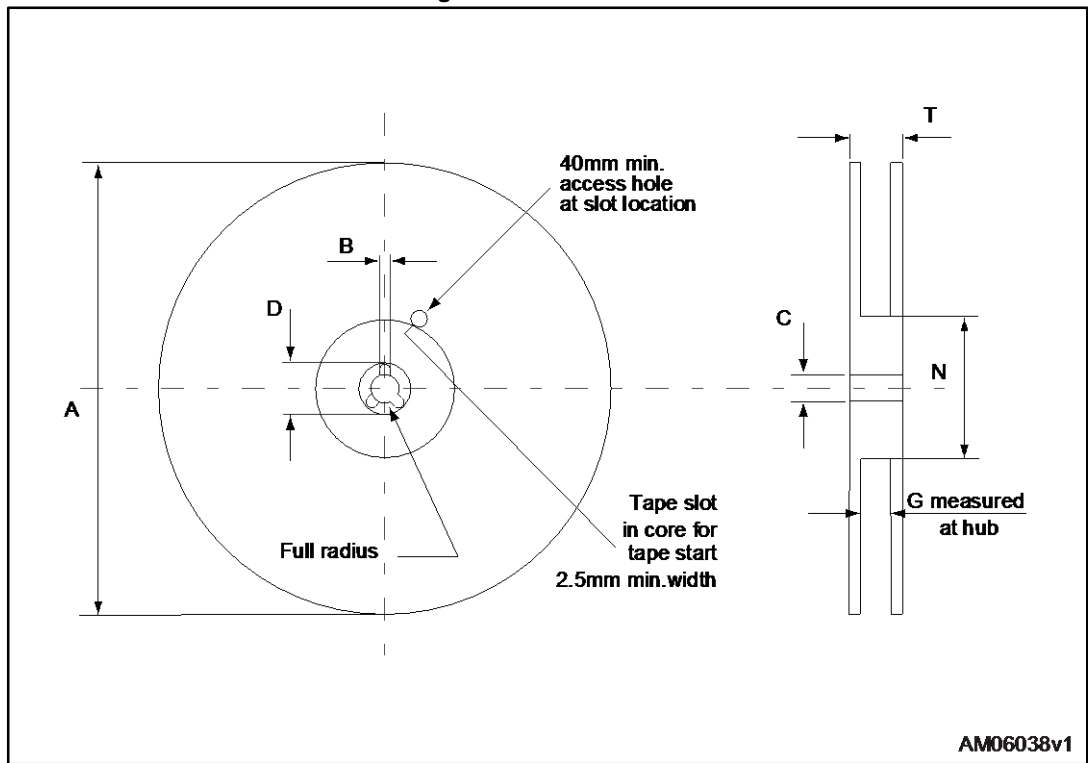
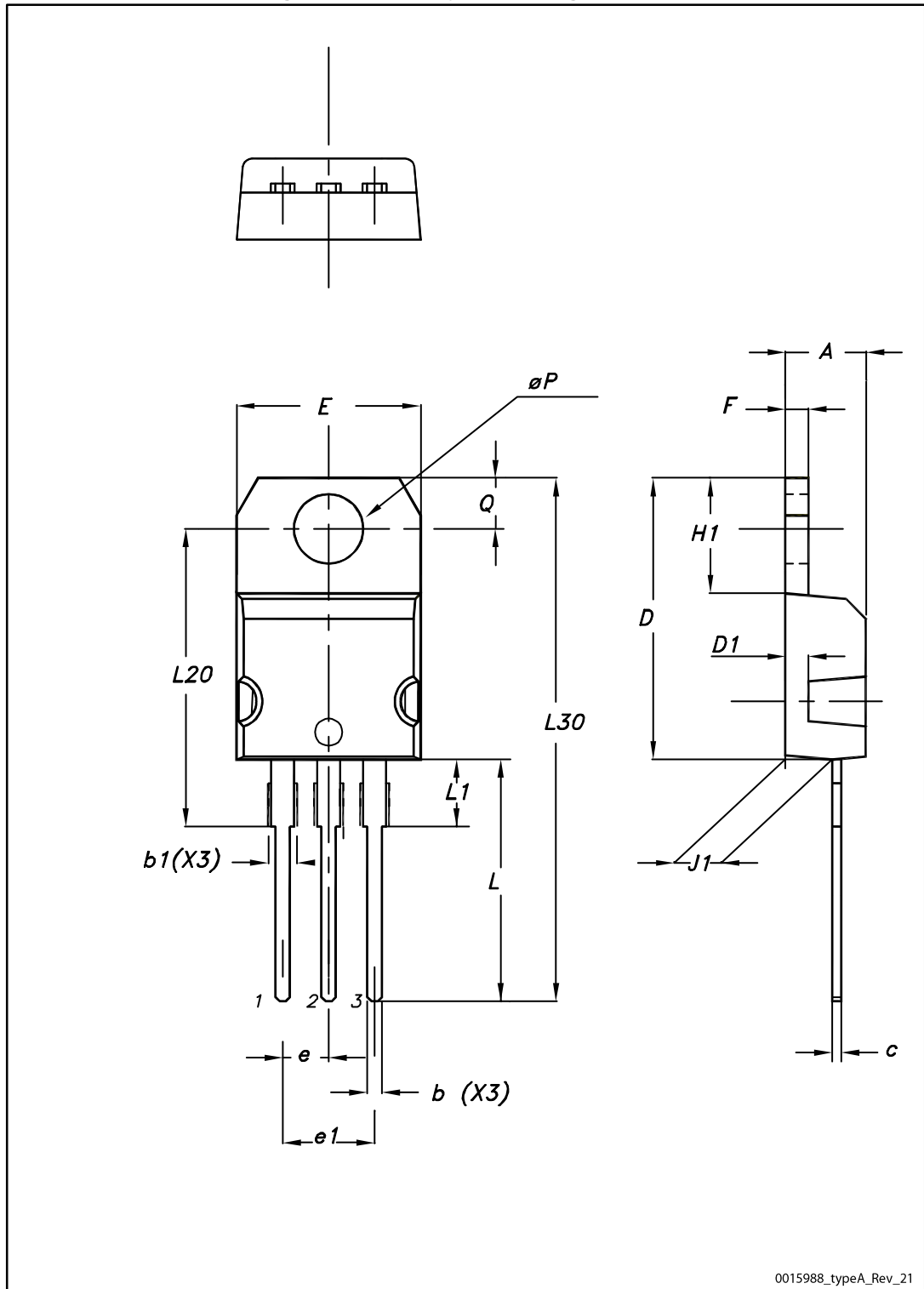


Table 9: D<sup>2</sup>PAK tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

## 4.3 TO-220 type A package information

Figure 26: TO-220 type A package outline



## Package information

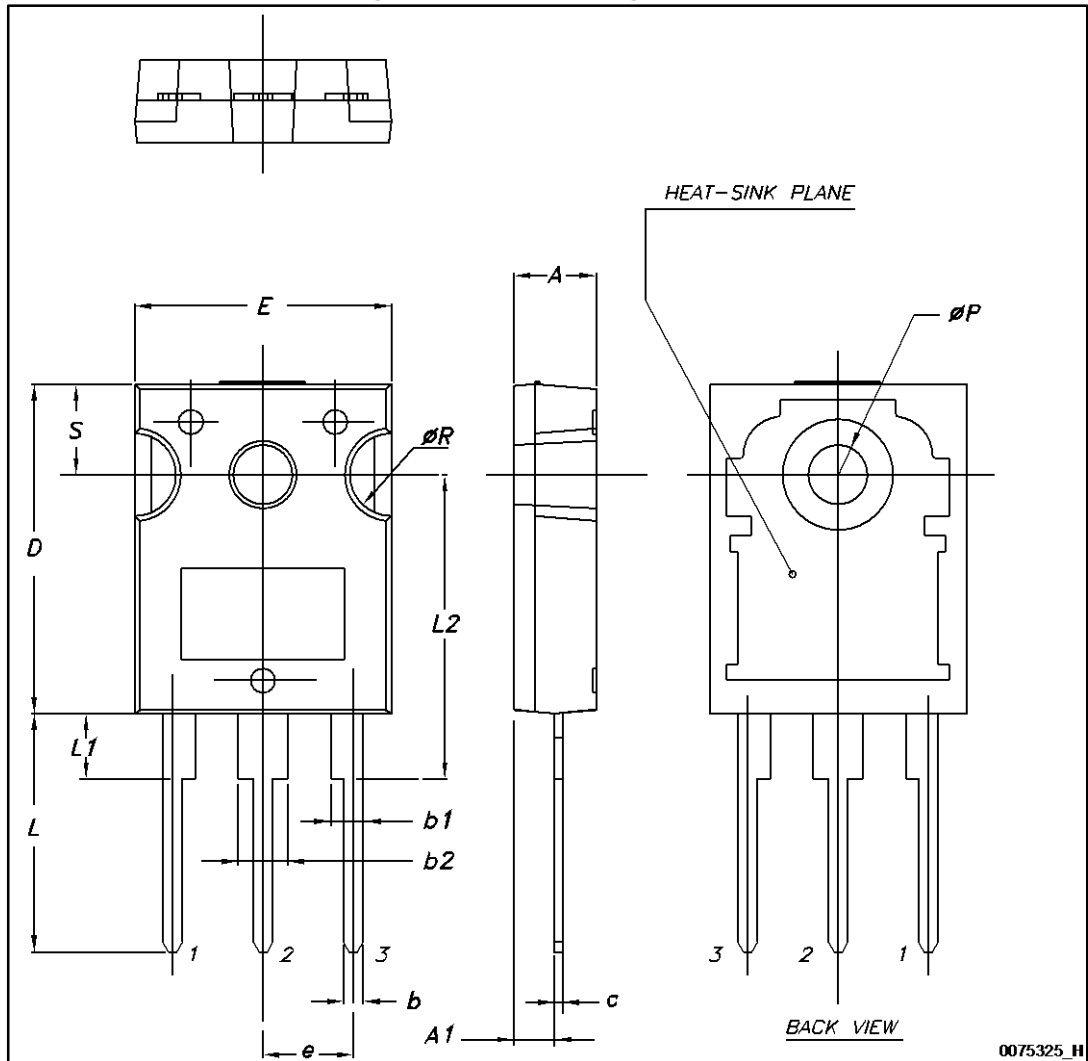
## STB46NF30, STP46NF30, STW46NF30

Table 10: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

## 4.4 TO-247 package information

Figure 27: TO-247 package outline



## Package information

## STB46NF30, STP46NF30, STW46NF30

Table 11: TO-247 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70

## 5 Revision history

**Table 12: Document revision history**

Date	Revision	Changes
28-Sep-2012	1	First release.
24-Aug-2016	2	Modified: <a href="#">Table 7: "Source-drain diode"</a> Minor text changes

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved

## OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we stricly control the quality of products and services. Welcome your RFQ to

Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.